REMARKS

Claims 1 - 3 and 20 - 29 are pending in this application. Applicants gratefully acknowledge the Examiner's allowance of claims 2 and 3. Reconsideration of the other pending claims is respectfully requested in view of the following remarks.

With respect to Applicant's previous arguments, the Examiner states that Applicant was incorrect in stating in the previous response that "Sakamoto discloses a hybrid stepping motor...". Applicant agrees with the Examiner that Applicant was incorrect and that Sakamoto instead discloses a permanent magnet stepping motor.

The Examiner rejects claims 1 and 20 - 29 under 35 USC § 103 over Sakamoto '161 (U.S. Patent No. 5,386,161) in view of Bedford (U.S. Patent No. 3,678,352). The Examiner states that Sakamoto '161 discloses a magnet type stepping motor having a cylindrical permanent magnet rotor with alternating N and S poles and having three phase three phase windings and 6m pieces of stator main poles with one phase wound around a first and every third poles. Sakamoto '161 does not show m pieces of N pole and m pieces of S pole formed alternately on the 6m pieces of stator main pole corresponding to the excited stator windings. However, Bedford discloses in Fig. 4a three phase windings, the winding of one phase wound around a first pole and a fourth pole of a six pole permanent magnet motor, with a S pole and a N pole formed alternately on the six pieces of stator main pole corresponding to an excited phase. The Examiner states that it would have been obvious to utilize the winding arrangement of Bedford in the circuit of Sakamoto '161 ...if, after the motor is laid out with a certain number of phases, stator poles and rotor poles, the layout produced stator poles facing rotor poles of opposite polarity.

This rejection is respectfully traversed. Sakamoto '161 does not show a motor wherein the motor is laid out such that excited stator poles face rotor poles of opposite polarity. The last statement in the above paragraph begs the question of what motivation is provided for modifying the motor of Sakamoto '161 such that when the stator windings of one phase are excited with a

direct current, m pieces of N pole and m pieces of S pole are formed alternately on those pieces of stator main pole that correspond to the excited stator windings, as recited in claim 1.

In other words, as noted by the Examiner, Sakamoto '161 discloses a permanent magnet motor wherein three phase stator windings are arranged such that when the stator windings of one phase are excited with a direct current, the stator pole pieces corresponding to the excited phase have the same magnetic pole type. For example, referring to Figure 3 of Sakamoto '161, when the first phase stator windings are excited, stator poles 1-1 and 1-4 both form N poles.

In contrast, in the present invention as defined in independent claims 1, 24 and 29, when the stator windings of one phase are excited with a direct current, alternating N and S poles are formed on the stator poles corresponding to the excited phase. For example, referring to Figure 1, when stator windings 21-1 and 21-4 are energized, pole 22-1 forms a S pole, while pole 22-4 forms a N pole.

Bedford discloses brushless permanent magnet motors. In one embodiment, the Bedford motor uses three pairs of opposing 60° stator windings (see column 9, lines 5 - 12; Figure 4a). In the embodiment disclosed in Figure 4a, opposing stator windings operate to form opposing N and S poles when excited. In Bedford, the excitation of one phase of the stator windings is accomplished with the stepped waveforms illustrated in Fig. 4b of Bedford. Bedford at column 3, lines 10-15 states: "Figs. 4b and 4c show respectively the quasi-square voltage wave shapes supplied to three adjacent stator windings of the Fig. 4a motor by the motor control circuit of Fig. 2b when modified to have delta-connected pairs of stator windings as illustrated in Fig. 4c." Further, the brushless motor of Bedford requires a sensor for sensing the position of the rotor and a feedback circuit for the sensor output.

If the winding arrangement of the Bedford motor were utilized in the Sakamoto motor, when the windings corresponding to stator poles 1-1 and 1-4 are excited with a direct current, one stator pole would become N, and the other would become S. In this case, stator poles 1-1 and 1-4 would exert equal but opposite torque forces on the rotor. The total torque would

amount to zero. Thus, if the winding arrangement of Bedford were utilized in the Sakamoto '161 motor, the Sakamoto motor would be rendered inoperative.

If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification (MPEP § 2143.01, citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)).

Therefore, Applicants respectfully submit that Sakamoto '161 in view of Bedford does not render independent claims 1, 24 and 29 obvious.

The Examiner alternatively rejects claims 1 and 24 under 35 USC § 103 as being anticipated by Bedford in view of Ray (U.S. Patent No. 5,804,941) and Crosetto et al. (U.S. Patent No. 4,795,936). The Examiner states that it would have been obvious at the time the invention was made for one of ordinary skill in the art to have utilized the control system of Ray with the motor of Bedford in order to use the Bedford device for controlling various machines.

As discussed above with respect to Bedford, Bedford discloses a brushless motor having a rotor of the convex pole type permanent magnet having two poles, as shown in Fig. 4a. Further, the Bedford motor does not include all the limitations recited in claims 1 and 24 because the Bedford motor does not include a rotor including a cylindrical permanent magnet magnetized in the circumferential direction.

The motor of Ray does not cure the deficiencies of the motor of Bedford. In particular, the motor described in Ray is a switched reluctance stepping motor also having a rotor of convex pole type, as seen in Fig.1 of Ray. This rotor is not a permanent magnet at all, and is certainly not a cylindrical permanent magnet.

Crosetto et al. describes a rotor having a permanent magnet, but otherwise also does not disclose a cylindrical permanent magnet magnetized in the circumferential direction so as to form Z/2 pieces of N pole and Z/2 pieces of S pole alternately, where Z is the number of rotor

poles, as recited in the claims.

Thus, the combination of Ray, Bedford and Crosetto does not teach or suggest all of the limitations recited in independent claims 1, 24 and 29. Therefore, Applicants respectfully submit that independent claims 1, 24 and 29 define patentable subject matter. Claims 20-23 depend from independent claim 1, and claims 25-28 depend from independent claim 24 and therefore also define patentable subject matter. Accordingly, Applicants respectfully request the withdrawal of the rejections under 35 USC § 103.

CONCLUSION

Based on at least the foregoing amendments and remarks, Applicant respectfully submits this application is in condition for allowance. Favorable consideration and prompt allowance of claims 1 and 20-29 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below.

The Commissioner is hereby authorized to deduct any additional fees arising as a result of this Amendment or any other communication from or to credit any overpayments to Deposit Account No. 50-2522.

Respectfully submitted,

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